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1968-1969

STATE OF ALASKA
Keith H. Miller, Governor

ANNUAL REPORT OF PROGRESS, 1968 - 1969

FEDERAL AID IN FISH RESTORATION PROJECT F-9-1

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME
Wallace H. Noerenberg, Acting Commissioner

Rupert E. Andrews, Director
Division of Sport Fish

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INTRODUCTION

This report of progress involves the findings and work accomplished under the State of Alaska, Federal Aid in Fish Restoration, Project F-9-1, "Sport Fish Investigations of Alaska".

The work conducted during this reporting period constitutes effort on nine separate studies which are crucial in evaluating the sport fishing resources of the State. Recreational demands have necessitated broadening our knowledge of the fishery. All 20 jobs were of continuing nature enabling the Department to keep abreast of present and future impacts on certain fish species. Specifically, the work included work on inventory and cataloging of the sport fish and sport fish waters of the State, sport fishery creel census and access. Special emphasis was given to Dolly Varden, silver salmon, anadromous fish, grayling, salmon, sheefish, pike, and char. The information gathered has provided supporting documentation for better fish management and a basis for necessary future investigations.

The subject matter contained in these reports may be inconclusive. The findings and interpretation are subject to re-evaluation as the work progresses.

RESEARCH PROJECT SEGMENT

STATE: ALASKA

Project No:: F-9-1

Job No:: 11-A

Name: Sport Fish Investigations of Alaska.

Title: Inventory and Cataloging of the Sport Fish and Sport Fish Waters in the Cook Inlet Drainage.

Period Covered: July 1, 1968 to June 30, 1969.

ABSTRACT

Net population sampling data is presented from 40 lakes sampled from May, 1968, through February, 1969.

Eleven lakes were stocked with silver salmon, Oncorhynchus kisutch, in 1967. A discussion of planting success in those lakes and possible reasons for the failure of some lakes to produce a successful sport fishery is presented.

Six lakes were stocked with catchable-sized rainbow trout, Salmo gairdneri. Sampling indicated few trout remained after a summer angling season. At age II and older, these trout averaged smaller than trout planted as fry in several Matanuska Valley Lakes.

Volumetric surveys were completed on three lakes.

Index areas on which to enumerate spawning silver salmon were established on five tributary streams of the Susitna River. Data is presented on numbers and timing of silver salmon within these areas.

Access to two lakes was secured, and negotiations with three landowners for an access trail to Upper Bonnie Lake are near completion.

RECOMMENDATIONS

1. That enumeration of spawning silver salmon be continued within established index areas.

2. That evaluation of silver salmon stocked in Matanuska Valley Lakes in 1967 be continued.

3. That surveys of lakes and streams near Talkeetna and along the new Fairbanks highway west of the Susitna River be initiated as time and manpower permit.

4. That a limited study of Arctic grayling, Thymallus arcticus, in 17-Mile Lake be initiated to define spawning sites, timing and growth rates.

5. That catalog and inventory of lakes within the Nancy Lake State Recreation area be reduced until access roads are constructed into the area.

OBJECTIVES

1. To assess and record fish stocks and the environmental characteristics of the existing and potential recreational waters of the job area.

   To investigate, evaluate, and develop plans for the enhancement of anadromous fish stocks.

2. To evaluate application of fishery restoration measures and availability of sport fish egg sources.

3. To assist as required in the investigation of public access status to the area's fishing waters, and to make specific recommendations for selection of sites for segregation.

4. To evaluate multiple water-use, development projects (public and private) and their effects on the area's streams and lakes for the proper protection of the sport fish resources.

5. To make recommendations for the proper management of the sport fish resources in the area, and to direct future studies.

TECHNIQUES USED

Lakes were sampled with 125- by six-foot, variable mesh (3/4 to two-inch bar measure) monofilament gill nets. Usually two nets were fished for approximately 24 hours each.

Seines were 50- by 6-foot, 1/4-inch bar measure nylon.

Surveys of silver salmon index areas consisted of repeated stream bank foot surveys.

Volumetric lake surveys were made on the ice. Sample points were established by a grid using a surveyor's chain and transit. Depth determinations were made at the intersecting points of the grid. Distances between grid lines ranged from 50 to 200 feet, depending upon the contours of the bottom as determined by prior preliminary surveys. Depth readings were made through the ice using a Ross P-100 fathometer with the transducer immersed in a spot of ethylene glycol.

FINDINGS

Due to the transfer of a new biologist into the district, emphasis was placed on sampling of managed lakes and determining the population status of more accessible waters.

Concurrent with test-net sampling, observations and seining of shorelines were conducted to determine which lakes were currently free of threespined sticklebacks, Gasterosteus aculeatus. A summary of lakes found to be devoid of stickleback is shown in Table 1.

TABLE 1 - A Summary of Upper Cook Inlet Lakes Found to be Devoid of Threespined Sticklebacks, 1968.

Lake Name	Location	Lake Name	Location
Bonnie (Lower)	T20N, R6E, S23-24	Bradley	T17N, R1E, S24
Bonnie (Upper)	T20N, R6E, S19	Canoe	T17N, R1E, S13
Drill	T20N, R5E, S26-27	DeLong	T12N, R4W, S3
Hilberg	T14N, R3W, S28	Echo	T17N, R1E, S24
Irene	T17N, R1E, S13	Falk	T17N, R2E, S14
Long (86 Mile)	T20N, R7E, S20-21	Florence	T19N, R5W, S23-24
Reed	T18N, R1E, S8	Gooding	T18N, R1E, S 22-23 / 27-28
Thompson	T14N, R2W, S11	Jewel	T12N, R4W, S10
Wishbone	T19N, R2E, S24	Kepler	T17N, R1E, S24
Seventeen-Mile	T19N, R3E, S 19-20 / 20-29	Triangle	T17N, R1E, S 13-14 / 23-24
Twelve-Mile	T19N, R2W, S6	Wolverine	T12N, R3E, S7-8

Of the 22 lakes listed in Table 1, the 11 lakes in the first column were found to be naturally devoid of stickleback. The first 10 lakes in the second column were chemically treated with rotenone or toxaphene. Wolverine Lake contains a wild population of Dolly Varden, Salvelinus malma, and rainbow trout.

DeLong Lake now contains a small population of Alaska blackfish Dallia pectoralis, although stickleback have not re-entered the lake. The lake has neither inlets or outlets.

All of the listed lakes have been or will be stocked with game fish, except Drill and Falk Lakes, which have no public access, and Wolverine Lake.

Population Sampling of Managed Lakes

Gill-net sampling was conducted in 36 managed lakes during the current reporting segment. Test-net data from 19 lakes, which have been periodically stocked, is shown in Table 2. Sampling of 11 lakes stocked with silver salmon in 1967 and six lakes stocked with catchable-sized rainbow trout are discussed separately.

Sampling in Lower Bonnie Lake failed to catch any rainbow trout from annual plants of about 25,000 fry per year made through 1966. Some natural reproduction occurs in the outlet and inlet creeks. Rainbow trout captured during the 1968 sampling were apparently progeny of natural reproduction.

Chrystal and Honeybee Lakes were treated with toxaphene in 1961 and stocked with silver salmon in 1963 and 1964. Large land-locked silver salmon from the 1964 planting were taken from both lakes. The silver salmon averaged 429 mm and 410 mm, respectively, and all were approaching

TABLE 2 - Population Characteristics of Managed Matanuska Valley Lakes as Defined by Variable Mesh Gill Nets, 1968-69.

Lake Name & Location	Sampling Date	Species Stocked	Number	Age Class	Length Range (mm)	Mean Length (mm)	Stocking History Total No.	Per Lb.	Per Acre	Date Stocked	Catch Per Net Hour
Bonnie (Lower) T20N, R6E, S19-20	7/8/68	RB	3	I	164-175	170	Wild stock--no RB plant in 1967.			---	0.08
Bradley T17N, R1E, S24	6/10/68	RB	3	II	312-333	322	18,000*	315	643	8/66	0.13
Chrystal T19N, R5W, S25	7/10/68	SS	5	IV	390-466	429	5,000**	--	40	1964	0.11
		RB	1	I	180	180	Wild stock		--	---	0.02
		DV	1	?	120	120	Wild stock		--	---	0.02
		LNS	1	?	110	110	Wild stock		--	---	0.02
Clunie T15N, R2W, S28-33	10/2/68	SS	0	--	---	---	15,000	2,500	146	6/65	0.00
		SS	0	--	---	---	2,000	?	--	4/68	0.00
Echo T17N, R1E, S24	6/10/68	--	0	--	---	---	Rainbow stocked annually except in 1967				
		RB	2	0	196-212	204	3,500	1,675	152	6/68	0.02
		SS	105	0	107-146	119	3,500	1,030	152	6/68	2.76
Falk T17N, R1E, S24	6/10/68	RB	3	III	371-414	399	3,000	?	158	1965	0.06
		RB	1	?	610	610	Age uncertain		---	---	0.02
Florence T19N, R5W, S23-24	6/10/68	RB	5	III	432-470	457	3,000	?	55	1965	0.11

TABLE 2 (Cont.) - Population Characteristics of Managed Matanuska Valley Lakes as Defined by Variable Mesh Gill Nets, 1968-69.

Lake Name & Location	Sampling Date	Species Stocked	Number	Age Class	Length Range (mm)	Mean Length (mm)	Stocking History Total No.	Per Lb.	Per Acre	Date Stocked	Catch Per Net Hour
Gooding	6/17/68	RB	0	--	---	---	17,400	315	311	8/66	0.00
T18N, R1E,	1/29/69	GR	0	--	---	---	20,000	---	357	6/68	0.00
S27											
Honeybee	7/10/68	SS	4	IV	221-504	410	2,500*	?	30	8/64	0.09
T19N, R4W,											
S29-30											
Irene	7/3/68	RB	4	II	405-425	414	4,700	315	224	8/66	0.08
T17N, R1E,		GR	3	IV	304-338	327	8,000	---	381	1964	0.06
S13											
Kepler	6/11/68	RB	5	II	343-477	396	18,000*	315	200	8/66	0.21
T17N, R1E,											
S24											
Long	6/19/68	RB	11	II	328-479	396	20,000	336	270	8/68	0.28
T17N, R1E,											
S13-14											
Long	7/8/68	GR	9	?	189-390	325	Age uncertain		---	---	0.20
T20N, R7E,		BB	1	?	153	---	Wild stock		---	---	0.02
S20-21											
Loon	9/10/68	RB	0	--	---	---	1,600	---	117	1965	0.00
T18N, R3W,											
S36											

TABLE 2 (Cont.) - Population Characteristics of Managed Matanuska Valley Lakes as Defined by Variable Mesh Gill Nets, 1968-69.

Lake Name & Location	Sampling Date	Species Stocked	Number	Age Class	Length Range (mm)	Mean Length (mm)	Stocking History: Total No.	Per Lb.	Per Acre	Date Stocked	Catch Per Net Hour
Ravine T20N, R6E, S19	7/3/68	RB	3	III	370-433	402	2,700	---	154	1965	0.07
Seventeen T19N, R3W S9-30	8/21/68	GR	228	Mixed	100-328	219	Wild progeny of original transplant.			---	6.16
Triangle T17N, R1E, S13-14	12/18/68	RB	9	0	140-211	175	3,000	984	200	7/68	0.19
		SS	76	0	99-189	148	3,000	855	200	7/68	1.62
Wiener T20N, R7E, S22	7/8/68	DV	2	?	140-210	175	Wild stock		---	---	0.04
		RB	3	II	285-310	298	10,800	336	400	8/66	0.06
Wishbone T19N, R2E, S24	7/23/68	--	0	--	---	---	Occasional RB catches are made from an unreported stocking.				0.00

*Plant divided between Kepler and Bradley.
**Stocking records indicate 1964 plant was rainbow trout.

sexual maturity. These lakes will not be restocked as stickleback have re-populated both lakes and longnose suckers, Catostomus catostomus, have re-entered Chrystal Lake.

Loon Lake was also treated with toxaphene in 1961. Net sampling produced no catch from rainbow trout planted from 1963 through 1965. Although the lake is landlocked, stickleback are again present in large numbers. In 1965 a dissolved oxygen level of 2.2 ppm was recorded (McGinnis, 1966) and game fish may have winter killed. Dissolved oxygen levels in Loon Lake will be closely monitored in the future to determine its fishery potential.

Ravine Lake has also been invaded by sticklebacks since the original 1959 survey, and the lake level has declined about eight feet. Gill-net sampling indicated that few game fish remain in the lake. The relative success of the 1968 rainbow plant will be monitored to determine the feasibility of future management.

Gill-net sampling in Gooding Lake failed to capture any rainbow trout from the 1966 plant or grayling fry from the 1968 plant. Dissolved oxygen tests conducted on February 7, 1969, recorded only 0.5 ppm of dissolved oxygen and indicate that game fish in Gooding Lake may have winter killed. If future sampling indicates that the 1968 grayling plant did not survive, management of Gooding Lake will be discontinued.

The 1965 plant of 15,000 silver salmon (2,500 fry per pound) in Clunie Lake provided a stocking density of only 146 fry per surface acre. This low stocking density combined with small fry and a dense stickleback population probably explains the failure of these fish to enter the net catch.

Florence Lake sampling indicated a remnant rainbow trout population from the 1965 stocking. This lake was treated with toxaphene in 1961 and remains free of scrap fish. It is recommended that Florence Lake be re-stocked with rainbow trout.

Falk Lake, treated with rotenone in 1959, remains free of scrap fish and contains a small number of large trout from plantings made in 1965 and 1966. Due to access problems, no immediate management is planned.

It was impossible to accurately determine the age of grayling sampled in Long Lake (86 Mile). Some natural reproduction is known to occur in the outlet. Future sampling will be conducted to estimate the extent of natural reproduction. The lake will be planted on an alternate-year basis until more is known about the contribution of stock by natural reproduction.

Seventeen-Mile Lake is populated by progeny of a pre-Statehood transplant of grayling. Sample nets caught grayling at a rate of 6.16 fish per net hour in 1968 and no competing species were observed.

Six of the stocked lakes in the Kepler-Bradley Lakes Complex were sampled. This group of lakes is extremely productive with net catches of age II rainbow trout averaging about 400 mm, approximately 22 months after stocking in Long, Kepler, and Irene Lakes. Similar growth rates have been reported from Echo Lake, another lake in the same complex, by McGinnis (1963). In Bradley Lake, age II rainbow trout averaged 322 mm, and it is felt that the growth rate was probably suppressed by a high stocking density.

Of the seven stocked lakes in the complex, only Long Lake presently contains sticklebacks. Long Lake was chemically treated in 1966 with powdered rotenone, but a complete kill was not attained.

In 1968, equal numbers of silver salmon and rainbow trout fry were stocked in both Echo and Triangle Lakes to compare growth rates and to evaluate their compatibility when stocked together. Since silver salmon strike more readily during the winter than do rainbow trout, it was hoped that stocking both species together might provide more recreational angling days on a given lake. Table 3 summarizes data relating to stocking of Echo and Triangle Lakes.

TABLE 3 - A Summary of Fish Stocked in Echo and Triangle Lakes, 1968.

Lake	Date	Species	Size	Number	Fry Per Surface Acre
Echo	6/20/68	SS	1,030	3,500	150
	6/20/68	RB	1,675	3,500	150
Triangle	7/3/68	SS	855	3,000	200
	7/3/68	RB	984	3,000	200

This comparison of growth rates has obvious bias. The rainbow fry were slightly smaller than the silver salmon in Triangle Lake and substantially smaller in Echo Lake. This disparity in size could at least partially account for the poor catch of rainbow trout which made up only 11 percent of the net catch in Triangle Lake and two percent in Echo Lake. Possibly the more aggressive silver salmon fry simply deprived the rainbow fry of adequate food and space.

It is clear, however, that the surviving rainbow trout grew faster than the silver salmon. In Triangle Lake, rainbow trout averaged 175 mm and 0.19 pounds as opposed to 148 mm and 0.10 pounds for silver salmon. The difference in growth was similar in Echo Lake where the only two rainbow trout taken averaged 204 mm and 0.23 pounds, as opposed to an average of only 119 mm and 0.03 pounds for silver salmon fry.

Due to heavy angler demand on these lakes, poor survival of rainbow trout in competition with silver salmon, and the absence of competing stickleback, it is recommended that both lakes be stocked only with rainbow trout.

In addition to net sampling during 1968, trails to all stocked lakes in the Kepler-Bradley Complex were brushed out and signs were erected denoting direction and distance.

An informational handout, having a map and description of the various fisheries, was made up and released through Fish and Game offices and license vendors.

Sampling of Land-Locked Silver Salmon

Silver salmon comprise a significant portion of fry stocked in Matanuska Valley Lakes. This species is extremely important for winter fisheries as they feed voraciously and make up the vast majority of the winter sport fish catch in the Matanuska Valley. A critical evaluation of silver salmon stocking in the lakes is imperative.

In 1967, no rainbow trout were available for stocking in the Matanuska Valley, and 14 lakes were stocked with 505,100 silver salmon fry. In 1968, sampling was initiated to define the growth rates and the survival rates of silver salmon in 11 of these stocked lakes. Due to numerous variables, any conclusions are tenuous and subject to error. Some important variables include:

1. Fry sizes and stocking dates varied from lake to lake.
2. Stocking densities varied from lake to lake.
3. Variation exists between lakes in the level of competition from prior and subsequent plants of game fish and from indigenous stickleback populations.
4. Removal of stock by the sport fishery was variable and could not be measured.
5. Sampling bias of variable mesh gill nets.

Bias in gill net sampling is well known and has been described by numerous authors. When sampling small land-locked silver salmon there is a significant bias toward larger fish. Silver salmon of less than 130 mm are almost always taken in the single 25-foot panel of the smallest mesh (3/4-inch bar measure).

When sampling separate populations of equal density, those lakes having fish of larger average size should produce higher catch rates as larger individuals are more susceptible to the sample nets. In this study, increased susceptibility to the sampling gear should to some degree compensate for numerical decline of the populations.

Of the 11 silver salmon lakes sampled, only three lakes produced successful sport fisheries while eight did not. A summary of test-net data and stocking histories is shown in Table 4. It is clear from Table 4 that some lakes produced good populations of silvers while other lakes were almost total failures. With the limited data collected to date it is impossible to determine the specific reasons for success or failure. Some possible reasons are that all lakes, except Reed Lake, contain indigenous populations of threespine sticklebacks which are known to reduce survival of fry plants. Also, most of the lakes contain other age classes of stocked silver salmon, rainbow trout, or in the case of Big (Benka) Lake, an indigenous Dolly Varden population.

Stocking density appears to have been of critical importance in several lakes. The relationship between stocking density in terms of fry per surface acre and catch per net hour is shown in Figure 1. In only four lakes were sample nets able to catch silver salmon at a rate exceeding 1.0 fish per net hour. The highest net catches in Matanuska, Reed, Finger, and Mirror Lakes totaled 1.26, 2.23, 3.91, and 4.28 fish per net hour, respectively. Three of those lakes, Matanuska, Reed, and Finger, produced successful fisheries while Mirror Lake apparently failed because the fish were too small to appeal to the angler. All successful lakes were stocked at densities exceeding 200 fry per surface acre.

TABLE 4 - Stocking History and Growth Rates of Land-Locked Silver Salmon Stocked in Matanuska Valley Lakes During 1967 as Defined by Gill-Net Sampling, 1968-69.

Lake Name & Location	Date of Sample	Number	Length Range (mm)	Mean Length (mm)	Stocking History			Catch Per Net Hour	Percent Total Catch	Competing Fishes**
					Number	Size*	Fry Per Surface Acre			
Big (Benka) T24N, R4W, S9-10	8/29/68	22	106-189	149	12,400	352	108	0.57	39.0	DV, SB
Beverly T18N, R2W, S35-36	2/11/69	0	---	---	12,000	352	218	0.00	0.0	RB, SB
Finger	6/21/68	180	118-145	131	210,700	460	482	3.91	93.0	SS, RS
T17N, R1E,	7/27/68	33	139-165	157	---	---	---	0.79	72.0	RB, SB
S33	1/23/69	13	165-245	207	---	---	---	0.29	93.0	---
Knik	6/21/68	11	110-172	127	12,500	352	250	0.22	100	SB, SS
T16N, R3W, S24	1/17/69	9	216-310	279	---	---	---	0.19	45.0	---
Lucile	6/14/68	1	104	---	150,000	747	405	0.02	13.0	SS, SB
T17N, R1W,	8/23/68	0	---	---	---	---	---	0.00	0.0	---
S8-9	1/23/69	1	170	---	---	---	---	0.02	20.0	---
Matanuska	12/18/68	0	---	---	13,000	352	224	0.00	0.0	SB
T17N, R1E,	1/6/69	43	140-263	191	---	---	---	1.26	100	---
S23	2/14/69	41	143-267	177	---	---	---	0.85	100	---

TABLE 4 (Cont.) - Stocking History and Growth Rates of Land-Locked Silver Salmon Stocked in Matanuska Valley Lakes During 1967 as Defined by Gill-Net Sampling, 1968-69.

Lake Name & Location	Date of Sample	Number	Length Range (mm)	Mean Length (mm)	Stocking History			Catch Per Net Hour	Percent Total Catch	Competing Fishes**
					Number	Size*	Fry Per Surface Acre			
Mirror T15N, R1W, S1	6/19/68	223	102-131	118	40,000	646	500	4.28	95	SS, SB
Never-Never T17N, R4W, S34	3/4/69	0	---	---	8,200	206	293	0.00	0.00	SS, RB SB
Reed T18N, R1E, S8	6/6/68	107	132-170	152	5,200	352	281	2.23	81	RB
	1/28/69	19	173-204	185	---	---	---	0.45	95	
Rocky T17N, R3W, S16-21	7/3/68	3	99-125	111	11,200	352	193	0.07	43	RB, SB
	7/27/68	2	127-127	127	---	---	---	0.02	67	
Twin Island T14N, R4W, S9	8/7/68	18	107-217	142	7,100	216	47	0.29	95	KOK, SB

*Number per pound.
**Competing fishes include all other species and age classes of stocked silver salmon.

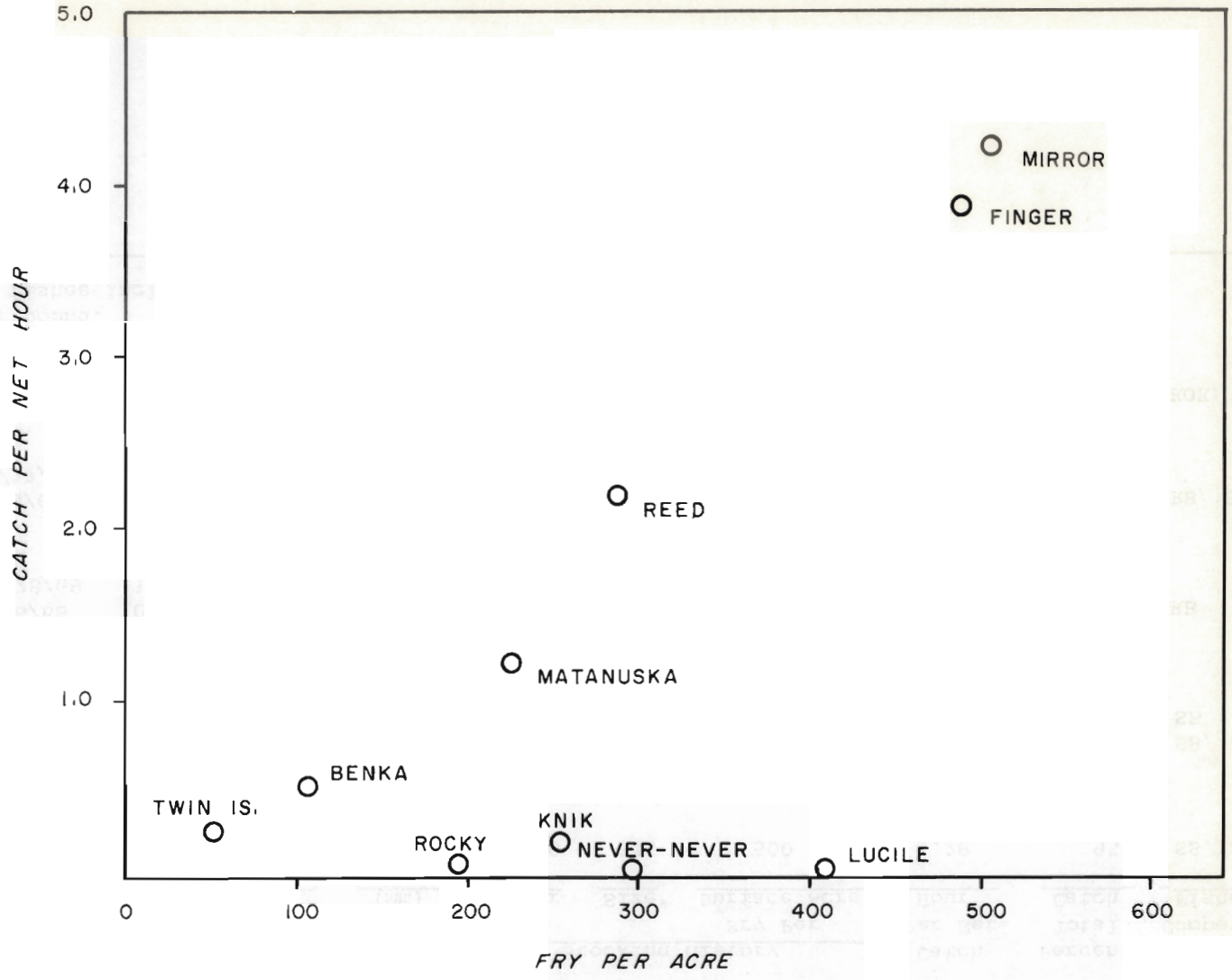

FIGURE 1. RELATIONSHIP BETWEEN STOCKING DENSITY AND GILL NET CATCH RATES IN LAKES STOCKED WITH SILVER SALMON, MATANUSKA VALLEY, ALASKA, 1968-69.

Figure 1 suggests that land-locked silver salmon should be stocked at densities ranging from 200 to 500 per surface acre and that Twin Island and Benka Lakes might have produced successful sport fisheries if stocking densities had been greater.

These data indicate that in this study, gill-net sampling, despite known bias and sampling variability, was sufficiently accurate to predict which lakes contained a high enough density of game fish to produce successful sport fisheries.

Listed below are the remaining eight lakes which failed to produce successful sport fisheries, with possible explanations for some failures:

1. Never-Never Lake: This lake has an active outlet to Big Lake and stocked fry apparently out-migrated. Silver salmon taken in sample nets were wild fry.

2. Beverly Lake: No stocked fish were taken in Beverly Lake. Additional sampling will be conducted to determine if any significant numbers of stocked fish survived.

3. Lucile Lake: From 1966 through 1968, there have been 305,500 silver salmon fry stocked in Lucile Lake. All three stockings have apparently resulted in extremely low survival. During 1968, this lake was sampled on three occasions and the catch per net hour never exceeded 0.02 fish per net hour. Survival of the 1967 plant may have been reduced by the stocking of fry weighing only 747 per pound. Lucile Lake presently contains a dense population of competing stickleback.

4. Rocky Lake: Sampling in Rocky Lake indicated an extremely low survival of stocked silver salmon. The lake is scheduled for chemical treatment in 1969 to remove a dense stickleback population and will be re-sampled prior to treatment.

5. Knik Lake: Gill-net sampling in Knik Lake also indicated poor survival of stocked silver salmon. However, the growth rate of silver salmon in Knik Lake during 1968 far exceeded that of any other lake. On June 21, 1968, the average size of silver salmon taken in gill nets averaged 127 mm, which was very similar to several other lakes. However, by January 17, 1969, the average size had increased to 279 mm, more than 70 mm greater than in any other lake. If increased growth were related to less competition from other individuals of the same plant, then the greatest growth would be expected from Rocky or Lucile Lakes which experienced minimum survival of stocked silver salmon, or Twin Island Lake, which was stocked at a low density. Knik Lake is also scheduled for chemical treatment in 1969. Intensive gill-net sampling will be conducted prior to treatment.

6. Twin Island Lake: Test nets in this lake caught silver salmon at a rate of 0.29 fish per net hour, which would appear to reflect a good survival for a plant of only 47 fry per surface acre. Twin Island Lake probably failed to produce a fishery because it was stocked at too low a density and because of its relative inaccessibility.

7. Big Benka Lake: This lake was stocked at a density of only 108 silver salmon fry per surface acre. Test nets caught these fish at a rate of 0.57 fish per net hour. These data indicate that the plant demonstrated good survival. In conjunction with a healthy wild population of Dolly Varden, Big Benka Lake should have produced a successful fishery if good angler access to the lake were available. However, the lake is located about one mile from the highway near Talkeetna and few anglers are even aware of the lake's existence.

8. Mirror Lake: This lake was stocked at a rate of 500 fry per surface acre and the net catch rate of 4.28 fish per hour is the highest catch rate of any lake sampled. The smaller size of the silvers in Mirror Lake accompanied by a continued slow growth rate through 1968, apparently did not produce fish of sufficient size to appeal to the angler. This high planting density in a lake with a maximum depth of only 10 feet apparently was too great to allow a satisfactory growth rate.

Monthly gill-net sampling in Matanuska Lake was initiated in December, 1968, to determine relative growth rates for silver salmon at various times of the calendar year. It is planned that in future years, managed lakes can be sampled during the winter when the work load is reduced and data comparisons are more valid. To allow comparison of net catches made at various times during the winter it is imperative that growth rates be better understood.

Data collected thus far is fragmentary, with the mean size of fish captured in February being smaller than those caught in January. No fish were caught in a December sample. The failure of gill-net sampling in Matanuska Lake on December 18, 1968, was apparently related to improper placement of sample nets.

Sampling of Non-Managed Lakes

Four non-managed lakes were sampled to determine populations trends or to determine if game fish were present. A summary of test-net data is shown in Table 5.

Willow Lake contains a large population of naturally-spawned silver salmon, some of which do not emigrate as smolts. Test nets captured 46 silver salmon, of which six exceeded 250 mm.

Rainbow trout were captured in Wasilla Lake test nets averaging 266 mm at a rate of 0.71 fish per net hour. It appears the rainbow population is at a healthy level of abundance.

No game fish were found in Johnson or Drill Lakes.

Sampling of Catchable Rainbow Trout

Population sampling was conducted on a series of lakes in the Anchorage area which have been stocked with catchable-sized rainbow trout. The complete stocking history of catchable rainbow trout in these lakes since 1965 is shown in Table 6. The principal purpose in net sampling was to evaluate the efficiency of the sport fishery in harvesting these fish and to gain some indication of the number of trout being carried over to the succeeding summer season.

TABLE 5 - Population Trends of Several Non-Stocked Lakes as Defined by Variable Mesh Monofilament Gill Nets, 1968.

Lake Name & Location	Date	Species	Number	Length Range (mm)	Length Mean (mm)	Catch Per Net Hour
Drill T20N, R5W, S26-27	7/22	No catch	--	---	---	0.00
Johnson T17N, R1E, S14	8/1	No catch	--	---	---	0.00
Wasilla T17N, R1W, 1-2 S11-12	8/23	RS	9	Not compiled		0.18
		SS	2	Not compiled		0.04
		RB	37	165-485	266	0.71
		LNS	56	Not compiled		1.02
Willow T19N, R4W, S 7-8 17-18	7/15	SS	46	104-409	142	1.00

TABLE 6 - Population Trends from Lakes Stocked with Catchable-Sized Rainbow Trout as Defined by Variable Mesh Monofilament Gill Nets, 1968.

Lake Name & Location	Date	Species	Number	Age Class	Length Range (mm)	Mean Length (mm)	Stocking History			Catch Per Net Hour
							Number	Size	Date of Plant	
DeLong T12N, R4W, S3	6/68	RB	4	III	324-365	339	750	2.5	6/66	0.03
Green T14N, R3W, S28-29	10/8	RB	7	II	322-370	344	1400	2.1	6/67	0.15
		RB	4	I	245-267	252	1034	5.2	6/68	0.09
Hilberg T14N, R3W, S28	10/8	RB	3	I	308-348	332	1000	5.5	6/68	0.12
Little (Fire Is.) Lat. 61° 10'N, Long. 150°12'W	6/25	RB	-	-	No Catch	-	-	750	2.5	6/66	0.00
		RB	2	II	364-365	365	749	2.5	6/67	0.07
Otter T14N, R3W, S24	10/2	RB	1	III	455	455	10000	3840	6/65	0.02
		RB	No Catch	III	---	---	20000	2.5	6/66	0.00
		RB	1	II	367	367	15840	2.5	6/67	0.02
		SS	6	I	115-162			Wild Stock		0.13
Thompson T14N, R2W, S11	10/2	RB	No Catch	III			3500	2.5	6/66	0.00
		RB	No Catch	II			2400	2.5	6/67	0 00
		RB	5	I	218-307	246	6043	2.2	6/68	0.10

Catchable rainbow trout are reared one full year before release and typically average about 2.5 trout per pound.

Sampling was conducted after the stocked trout had been subjected to a full summer of angling. Little and DeLong Lakes were sampled in June; however, no catchable trout had been stocked since June, 1967, and June, 1966, respectively.

Catch rates for the six lakes were quite similar, ranging from 0.02 to 0.15 fish per net hour. Allowing for normal sampling variation, these data indicate a very efficient harvest with few stocked game fish remaining over winter.

Growth rates of catchable rainbows after release appear to be somewhat lower than for rainbow stocked as fry in various Matanuska Valley lakes. Rainbow trout of age classes II and III sampled in Long, Florence, Kepler, Irene, Ravine, and Falk Lakes (Table 2) averaged longer sizes than trout of comparable age stocked as catchables.

With the exception of Little Lake, catchable-sized trout were sampled in October, while the Matanuska Valley lakes noted above were sampled early in the growing season from June 10 to July 3. Had the managed Matanuska Valley lakes also been sampled at the end of the growing season, it would have magnified this difference in growth rates.

The length of age I rainbows stocked as fry cannot be compared with the length of catchable rainbow at time of release as no rainbow trout were stocked in the Matanuska Valley during 1967.

Volumetric Surveys

Volumetric surveys were completed on three lakes. Volumetric data is presented in Table 7. Volumetric maps delineated by five-foot contour lines are on file in the Palmer Sport Fish Office.

TABLE 7 - Volumetric Data from Three Matanuska Valley Lakes Surveyed During 1968.

Lake Name	Location	Surface Acreage	Acre Feet	Maximum Depth
Rocky	T17N, R3W, S16-21	58.7	763.7	27
Knik	T16N, R3W, S24	50.4	963.6	37
Upper Fire	T15N, R1W, S31	24.7	538.8	33

Silver Salmon Enumeration

In an attempt to define annual fluctuations in the magnitude of silver salmon escapements into Upper Cook Inlet streams, index areas were defined and escapement counts were made within these index areas. Annual counts of spawning silver salmon will be continued for comparative escapement data.

During 1968, emphasis was placed on finding areas where significant numbers of silver salmon spawn, where physical conditions allow good counts to be made, and on determining the peak period of spawning for each area. Data collected in 1968 indicate that an additional two years will probably be required to finalize the best areas and to document the time of peak spawning.

A total of 17 streams were investigated for potential index streams of which 12 creeks were rejected due to poor counting conditions and/or limited spawning gravel. Index areas selected from the five remaining streams are described in Table 8, and a summary of enumeration data is presented in Table 9.

The count of 147 silver salmon in the Goose Creek index area probably reflects the majority of the fish entering this system. Few spawning silver salmon or redds were observed in three additional counts.

Seven counts were made in the Birch Creek index area. The counts extended over the entire spawning period, and it was possible to obtain a fairly accurate estimate of the total number of silver salmon spawning in the area. Spawning fish were observed up until freeze-up, and a total of 300 silver salmon are estimated to have spawned in the area.

TABLE 8 - Description of Silver Salmon Enumeration Index Areas, Upper Cook Inlet Streams, 1968.

Stream and Location	Description of Index Area
Goose Creek T23N, R4W	From the Willow Highway downstream, approximately 1.5 miles to the confluence with the Susitna River.
Birch Creek T25N, R4W	From Fish Lake outlet 1.3 miles downstream to the Alaska Railroad tracks.
Meadow Creek T17N, R2W	From Herkimer Lake outlet 1.3 miles downstream to the first culvert downstream from the Willow highway.
Fish Creek T17N, R3W	From the Big Lake outlet 3.1 miles downstream to a marker in the SW 1/4, SE 1/4, S33, R3W, T17N.
Cottonwood Creek T17N, R1W	From the gaging station at Farmers Loop Road crossing near Wasilla to 2.3 miles downstream to the Engstrom Road crossing.

TABLE 9 - Estimated Timing and Numbers of Silver Salmon in Escapement Index Areas, Upper Cook Inlet, 1968.

Stream	Counts	Estimated Peak of Run	Largest Count Attained	Date of Count	Estimated Total Silver Salmon Spawning in Index Area
Goose Creek	4	9/1-9/10	147	9/5/68	200
Birch	7	9/15-9/25	125	9/16/68	300
Meadow	4	9/1-9/7	54	9/24/68	300
Fish	1	undetermined	35	10/17/68	---
Cottonwood	2	undetermined	22	10/2/68	---

Four surveys were made along the Meadow Creek index area, and 54 silver salmon were observed during the highest count. The nature of the index area and the presence of bright silver salmon during each count indicated that this population of fish do not arrive on the spawning beds at the same time; therefore, the percentage of fish observed within the index area during any single count is quite low in relation to the total number of fish spawning in the area.

On October 17, 1968, a total of 35 silver salmon in post-spawning condition was observed in the Fish Creek index area. Although many redds were also observed, it was not possible to estimate the total number of silver salmon that had spawned in the area. Counts should be initiated in Fish Creek at an earlier date, and it may be feasible to extend the index area down to Knik Arm.

Twenty-two silver salmon were counted in the Cottonwood Creek index area on October 2, 1968; however, no estimate could be made of the total number of fish that spawned in the area. Counts should be initiated on Cottonwood Creek at an earlier date, and due to the swift nature of the creek, they should be conducted at close intervals.

Access Investigations

In cooperation with access personnel, access to numerous district waters was investigated during the current report segment. Deeded access was secured to Florence Lake and to a shoreline section of Upper Bonnie Lake. Negotiations for access to Falk Lake were unsuccessful; however, the land surrounding Falk Lake is held for sale. Negotiations will be initiated with the new landowner if a sale is completed.

Negotiations for access are presently in progress for angler entry to Matanuska and Johnson Lakes.

Negotiations are in the concluding stages with three landowners for easement to construct a 1.1 mile walking trail from Lower Bonnie Lake Campground to the shoreline area obtained on Upper Bonnie Lake.

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